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SCIENCE, STORIES AND THE ANTI-VACCINATION MOVEMENT

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Abstract: This paper discusses the theoretical and methodological approaches to the study of the use or non-use of expert-based information in policy-making. Special attention is paid to the Narrative Policy Framework introduced by Jones & McBeth in 2010. This theory of the policy process adopts a quantitative, structuralist and positivist approach to the study of policy narratives. The Narrative Policy Framework is useful for the analysis of the use of expert-based information to resolve so-called wicked problems, which are characterized by intense value-based conflict between policy coalitions. The methodological approach of the Narrative Policy Framework is illustrated using the policy issue of mandatory vaccination.

Key words: narrative policy framework; wicked problems; mandatory vaccination.

Introduction

It took the British merchant navy 264 years to introduce citrus juice to prevent scurvy among sailors following the demonstration of its effectiveness in 1601 (Mosteller, 2006, p. 516). This was a simple policy problem. The problem was well defined—scurvy was the greatest killer of the navy, worse than all other causes of death together (ibid.). It was equally easy to establish whether or not the problem had been solved—those who got the citrus fruit were cured in a few days. Yet, the scientific evidence was ignored. How optimistic should we be about the use of scientific evidence in solving "wicked problems" (Rittel & Webber, 1973), such as climate change, poverty or genetically modified food, which are characterized by extreme polarization, uncertainty and complexity?

This paper discusses the methodological approaches to the study of the use or non-use of expert-based information in the policy process. Special attention is paid to the Narrative Policy Framework, a new theory of the policy process that adopts a quantitative, structuralist and positivist approach to the study of policy narratives (Jones & McBeth, 2010). This approach assumes that narratives are more powerful than expert-based information (McBeth et al., 2007). This implies that the scientific evidence will be contested where wicked problems are concerned. Coalitions trying to expand the conflict and mobilize opposition will therefore contest the scientific evidence and appeal to emotions and rely more on

condensation symbols and policy surrogates. Section 2 discusses research utilization theories and public policy approaches to the study of expert-based or scientific information in the policymaking process. Section 3 illustrates the Narrative Policy Framework through the policy issue of mandatory vaccination. Section 4 presents the conclusions.

The use of scientific evidence in policy-making

Two strands of literature have developed independently of each other in seeking to determine whether expert-based information should be used in policy-making: (1) research utilization literature and (2) public policy theory.

Research utilization theories

The research utilization literature attempts to explain the use or non-use of expert-based information by policy-makers. The most prominent explanations highlight cultural differences between communities of researchers and policy-makers (Caplan et al., 1975; Dunn, 1980; Innvaer et al., 2002) or focus on the "enlightenment function" of expert-based information (Weiss, 1977).

The two communities theory (sometimes referred to also as metaphor or hypothesis) explains the under-utilization of research as a lack of interaction between researchers and policy-makers. These "two communities" or "two cultures" live in separate worlds and therefore fail to take into account the realities or perspectives of the other. Whereas social scientists are concerned with "pure" science, policy makers are action-oriented, practical people concerned with obvious and immediate issues (Caplan, 1979, p. 549). The most obvious strategy for increasing the use of research in policy involves bridging these two communities. However, the two-way personal communication might also promote selective (inappropriate) use of research evidence (Innvaer et al., 2002).

Interviews and surveys are the dominant data collection technique (see Innvaer et al., 2002). For example, Caplan et al. (1975) interviewed 204 upper-level executives in policy-influencing positions in the U.S. government regarding their use of social science knowledge in policy-related issues. Caplan (1979) then used multivariate analysis of this attitudinal data to explain the variance between users and non-users of expert-based information. Similarly, Sabatier (1984) based his critique of the "two communities" theory on the results of a survey of 800 faculty members at the University of California, Davis, which revealed that 42% had participated in some form of policy advising or research during the previous two years. Furthermore, the faculty interest in participation was somewhat independent of perceived contributions to professional advancement.

The "two communities" theory assumes a simple dichotomy of "use" versus "non-use" (Neilson, 2001, p. 3). However, the research does not feed into the policy-making process in a direct, or linear, manner (ibid.). Public policy literature therefore views expert-based information as another resource used to advocate and promote that person's interests (Sabatier, 1978; Wildavsky & Tenenbaum, 1981; Weiss, 1977). Thus, although the expert-based information may not have a direct and immediate impact on the policy process, research findings and concepts may lead to "enlightenment" (Weiss, 1977). This

term refers to "the percolation of new information, ideas and perspectives into the arena in which decisions are made" (Weiss, 1999, p. 471). For a broader review of the literature on knowledge translation, knowledge transfer, knowledge exchange, research utilization, implementation, diffusion, and dissemination in education on health professions, see Graham et al. (2006) or Mitton et al. (2007).

Public policy theories

Four of the most prominent theoretical approaches to the study of the policy-making process suggest that expert-based or scientific information plays a different role in the policy-making process (for a recent review of literature, see Weible, 2008). Expert-based and scientific information plays the most prominent role in the policy process in the Advocacy Coalition Framework, which predicts that information will be used as a resource in political debates to win policy disputes (Sabatier, 1987; Sabatier & Jenkins-Smith, 1999). The ACF integrates many of the major findings of the knowledge utilization literature, such as the "enlightenment function" of policy research, into a more general model of policy-making over periods of a decade or more (Sabatier, 1988). It builds on the assumption of bounded rationality, which states that decision-makers lack the ability and resources and therefore rely on heuristic or mental shortcuts rather than a rational cost-benefit analysis (Lord et al., 1979; Quattrone & Tversky, 1988; Scholz & Pinney, 1995; Simon, 1985). According to the ACF, a hierarchical belief system represents the most fundamental heuristic in policy decision-making. On the top tier are deep core beliefs, which stand for normative and ontological axioms. The core beliefs are very difficult to change, similar to religious conversion (Sabatier & Jenkins-Smith, 1993). Individuals therefore tend to screen out information dissonant with preexisting beliefs (Weible & Sabatier, 2009, p. 196). Policy learning or policy change is therefore more likely to occur at the level of policy core beliefs or secondary beliefs. The former are of moderate scope and range from normative to empirical beliefs, the latter are narrower in scope and require fewer agreements for change (Sabatier & Jenkins-Smith, 1999). The reliance on heuristics implies that scientific information does not guarantee an immediate policy victory. Nevertheless, the gradual accumulation of information, such as a scientific study or policy analysis, may contribute to belief change over long periods of time (Bennett & Howlett, 1992; May, 1992; Sabatier, 1987). Scientists, analysts and consultants are therefore crucial members of coalitions (Weible, 2006, p. 100). Since the ACF's inception in 1988, the case study approach has been the dominant methodological approach to applying the ACF framework (Weible & Sabatier, 2007, p. 123).

Kingdon's (1984) Agenda-Setting (Multiple Streams) model explains why some issues are considered for policy-making and others are not. According to Kingdon (1984, p. 92), there are three families of processes in agenda-setting: problems, policies, and politics. Expert-based information is placed in two of the streams. In the policy stream, people in and around government use expert-based information to translate a condition into a problem, i.e. to convince others that something must be done about the issue at hand (Kingdon, 1984, p. 119). In the policy stream, actors link problems with solutions. Policy proposals are most often generated by specialists within a policy community. However, for an idea to be picked up by the policy community, policy entrepreneurs are needed (Kingdon, 1984, p. 151).

Kingdon identifies two major "survival criteria" required for policy solutions to survive in the political stream: technical feasibility and value acceptability. To sum up, expert-based information helps identify causes of policy problems in the problem stream and enables policy entrepreneurs to legitimize the proposed policy solution in the policy stream.

Punctuated Equilibrium Theory suggests that policy-making develops in two phases: (a) periods of stability as issues emerge or disappear from the public agenda and (2) periods of punctuated policy change. During the first period, actors neglect new information because it is at odds with existing social constructions of policy issues (Baumgartner & Jones, 1993). These "policy images" are a mixture of empirical information and emotive appeals related to core political values. For example, nuclear energy may be associated with the promise of cheap energy and economic development or with the nuclear risks symbolized by Chernobyl. Any adjustment of behavior to new information is therefore radical because actors overcompensate for previous neglect. Expert-based information may thus be used to define and redefine policy images. A new policy image may attract new participants and policy entrepreneurs may try to shift the policy venues to advance their case. If policy entrepreneurs want to maintain the status quo, they will use science, symbols and rhetoric to legitimize existing policy solutions; on the contrary, if they want punctuations, they will use science to challenge the legitimacy of current policy solutions and mobilize allies for change (Weible, 2008, p. 618; Pralle, 2006).

Finally, social constructivists suggest that expert-based information should be viewed as a social construct used by policy makers to reinforce or destroy dominant social constructions of the policy issue (Schneider & Ingram, 1997; Ingram et al., 2007). This is particularly true of "wicked problems" (Rittel & Webber, 1973), characterized by extreme polarization, uncertainty and complexity, which produce situations where "the only things left to examine are...stories" (Roe, 1994, p. 3). These "stories" or "policy narratives" exist and persist because they simplify complexity and ambiguity (Roe, 1991, p. 288).

The view that narratives are more powerful than expert-based information is supported by a growing body of empirical evidence from fields such as risk analysis (Golding et al. 1992), Narrative Policy Framework (McBeth et al., 2007) or scenario-planning (Swap et al., 2001; Chermack, 2004). For example, Golding et al. (1992) put forward a case for the importance of social and cultural context and the role of complex interactive networks linking expert and lay audiences. Their research design involved an experiment modeled on a clinical trial study in which they used the case of radon to determine whether technical or narrative forms of risk communication were more effective at capturing people's attention and modifying behavior. They developed two newspaper series published in the newspapers of two Massachusetts communities. The technical series presented authoritative, factual risk information, whereas the narrative series consisted of personalized accounts of individuals making decisions about radon testing. Homeowner attitudes, knowledge and responses were then monitored in baseline and follow-up telephone surveys in both communities and a third control community. The results suggest that story-telling might be better at retaining the attention of readers than expert-based information. However, the sample was too small to draw definitive conclusions about the relative effectiveness of the two formats.

Policy narratives are thus defined as stories which "underwrite and stabilize the assumptions for policymaking in situations that persist with many unknowns, a high degree

of interdependence, and little, if any, agreement" (Roe, 1994, p. 34). Like any good story, policy narratives identify heroes who support the preferred policy, villains who thwart the policy and victims who suffer because the policy has not been adopted (Stone, 1988). Furthermore, policy narratives are developed strategically to convince the hearers or persuade them to do something (Roe, 1991, p. 288). However, the post-positivist view that facts are social constructions has been criticized for failing to provide clear concepts and falsifiable hypotheses (Sabatier, 2000).

Narrative policy framework

To address these criticisms, Jones & McBeth (2010) introduced the Narrative Policy Framework as a quantitative, structuralist, and positivist approach to the study of policy narratives. The Narrative Policy Framework defines three levels at which narrative cognition and communication can be studied: micro, meso and macro. At the micro level, Jones & McBeth (2010) hypothesize that an individual is more likely to change his opinion if (i) the narrative alters how the individual views the world, (ii) if the individual identifies with the hero in the narrative, (iii) if the narrative is in line with the individual's prior beliefs, and (iv) if the individual trusts the source of the narrative. Survey research and "within subjects" survey methods dominate methodologies at the micro level (Shanahan et al., 2013, p. 456).

Studying public opinion at the micro level enables us to identify only a narrow set of factors that affect policy outcomes and ignores the indirect influence policy narratives have on policy outcomes through influences over coalition composition (Jones & McBeth, 2010, p. 345). The meso-level study of policy narratives therefore focuses on the strategic construction of policy narratives by competing coalitions. Methods of choice have tended to rely almost exclusively on the quantitative content analysis, more precisely a directed approach to content analysis, which aims to validate or extend conceptually a theoretical framework or theory (Hsieh & Shannon, 2005, p. 1281). Jones & McBeth (2010), McBeth et al. (2007) and Shanahan (2013) propose the following hypotheses:

1. Identifying winners and losers: (i) a coalition will portray itself as losing to expand the conflict and mobilize opposition in order to change the status quo, (ii) a coalition will portray itself as winning to contain the issue and maintain the status quo, and (iii) policy actors will use narratives to split opposing coalitions.

2. Construction of benefits and costs: (i) when discussing the opposing policy alternative, the coalition will expand the issue by diffusing costs and concentrating benefits, (ii) when discussing the preferred policy alternative, the coalition will contain the issue by concentrating costs and diffusing benefits (Shanahan et al., 2011).

3. The use of condensation symbols: losing groups are more likely to use condensation symbols to expand the conflict than winning groups.

4. The policy surrogate: The losing groups are more likely to entangle policy issues in larger, emotionally charged debates to expand the scope of the policy issue.

5. Scientific certainty and disagreement: winning groups are likely to define the issue in terms of scientific certainty and ignore larger normative issues involved in the controversy, losing groups will attack scientific results and convey scientific disagreement in an attempt to open up the issue for continued deliberation.

6. The devil shift: In high-conflict situations, political actors will overstate the power and "evilness" of their opponents while simultaneously understating their own power.

Finally, at the macro level, NPF examines how policy narratives of institutions and cultures shape policy processes at the meso level. However, no macro-level study has been conducted up to date. Further criticism may be directed at the lack of linkages between the micro and meso levels (Shanahan et al., 2013, p. 461). In other words, it is not entirely clear how changes at the micro level can actually lead to changes at the meso level and vice versa.

Public policy documents generated by policy coalitions are the main sources of narratives. These include—but are not limited to—speeches, newsletters, press releases or editorials (ibid.). Public policy documents are used to measure political narrative tactics (McBeth et al., 2010, Shanahan et al., 2013), policy beliefs (McBeth et al., 2005) or lobby activities (Shanahan et al., 2010). A public policy document is considered a narrative if it includes a (1) policy stance or a judgment on a policy-related behavior and (2) at least one character who is cast as a hero, villain or victim (Shanahan, 2013, p. 457). The public policy documents are content analyzed for narrative elements and narrative strategies. The former are defined as use of characters, story type, causal mechanisms, solutions, and evidence; the latter include the distribution of costs and benefits of the proposed policy solution and the opposing solution and the use of the devil shift (Jones & McBeth, 2010; Shanahan et al., 2013, see also Table 1 below).

Illustration of methodology: mandatory vaccination

I will illustrate the advantages of the NPF using the issue of mandatory vaccination. There is a growing literature on health and digital literacy which suggests that users' vulnerability to obtaining non-reliable information on the Internet is associated with lower socioeconomic status, lower cognitive ability and older age, lower literacy and numeracy and less knowledge about vaccination (see the discussion in Betsch et al., 2012). Furthermore, the anti-vaccinationists discursively resist vaccination through a reframing that constructs risks as unknown and non-random while at the same time frame themselves as "free thinkers" (Hobson-West, 2007). It is therefore possible to define mandatory vaccination as a "wicked problem" (Rittel & Webber 1973), which resists "resolution by appeal to the facts" (Schon & Rein, 1994, p. 4).

Micro level

At the micro level of analysis, experimental design and surveys may be used to allow researchers to determine the extent to which the policy narratives resonate with the public (Jones & McBeth, 2010, p. 347, Shanahan et al., 2013, p. 457). For example, Nyhan et al. (2014) examine what types of messages are effective in overcoming parental reluctance to vaccinate. Although the authors do not make specific references to the NPF, their study may serve as an illustration of the methodological approaches to the study of how policy narratives shape public opinion. Nyhan et al. (2014) surveyed a nationally representative group of parents with children living at home in 2011, randomly assigning them to one of four interventions: (1) information from the CDC explaining the lack of evidence that the

MMR vaccine causes autism; (2) textual information from the Vaccine Information Statement about the dangers of the diseases prevented by MMR; (3) images of children with diseases prevented by the MMR vaccine; (4) a dramatic narrative from a Centers for Disease Control and Prevention fact sheet about a baby who almost died from measles; or to a control group. This design enables us to test whether the parents are more likely to respond to technical or narrative forms of communication. Surprisingly, none of the interventions increased parental intent to vaccinate a future child. Although corrective information reduced misperceptions about the vaccine/autism link, it also decreased intent to vaccinate among parents with the least favorable attitudes toward vaccines. Furthermore, images of sick children and the narrative about an infant in danger increased beliefs in serious side effects of vaccines.

Freed et al. (2011) suggest that the source of vaccine-safety information may have an impact on the manner and frequency of its use. Like Nyhan et al. (2014), Freed et al. (2011) surveyed a nationally representative group of parents with children living at home in 2009. Parents named their children's doctor as the most trusted source of vaccine information (76% placed great trust in their doctor). Other sources were trusted much less: other health care providers (26%), government vaccine experts/officials (23%), and family and friends (15%). Celebrities were trusted a lot by 2% of the respondents and not at all by 76% of respondents. Freed et al. (2011) also document the varying levels of trust by gender (women > men) and race/ethnicity (Hispanics > other groups). These findings are in line with the NPF's assertion that an individual's trust in the source of the narrative is likely to lead to a change in an individual's opinion (Jones & McBeth, 2010).

Meso level

At the meso level, the study of policy narratives in NPF focuses on the strategic construction of coalitional policy narratives in contentious policy battles (Shanahan et al., 2013, p. 457). Of particular interest is the relationship between the construction of these narratives and winning and losing in the policy arena. When examining the case of mandatory vaccination, it is reasonable to hypothesize the following. First, the anti-vax coalition seeks to challenge the status-quo. It will, therefore, try to expand the issue and mobilize opposition. It will portray itself as losing the policy battle. It will emphasize the diffused costs and concentrated benefits of the opposing policy solution. It will rely on condensation symbols and policy surrogates. It will emphasize scientific disagreement. It will repeatedly frame its opponent as a villain. The opposite will be true for the pro-vax coalition, which aims to contain the issue and preserve the status quo (see also section 2.3 and Table 1).

The study of mandatory vaccination at the meso level should proceed in several steps. First, it is necessary to identify the relevant public policy documents. At the meso level, these include speeches, press releases, editorials, blogs or open letters produced within a certain policy subsystem during a certain period of time. At the macro level, we would be interested in institutional or cultural narratives, such as those produced by the World Health Organization (Andre et al., 2008). As already noted above, the public policy document must include a policy stance and at least one character to be considered a narrative (Shanahan, 2013, p. 457).

Table 1. Policy narratives

	Definition	**Example**
Narrative Elements		
Statement of a Problem	A policy narrative is always built around a stated problem	Vaccines are harmful to children's health. (anti-vax)
Characters	The participants in a policy narrative	
Victim	The entity hurt by a specified condition.	Unvaccinated children and others dependent on herd immunity, such as newborns or immunocompromised individuals. (pro-vax)
Villain	The entity responsible for the damage done to the victim.	Pharmaceutical companies which only care about the profits and not the health of our children. (anti-vax)
Hero	The entity designated as fixing or being able to fix the specified problem.	Scientific community. (pro-vax)
Causal mechanism	A theoretical relationship denoting a cause and effect relationship between one or more independent variables and a dependent variable. Common causal relationships include intentional, mechanical, inadvertent, and accidental (Stone, 2012)	Intentional: Vaccination works. (pro-vax)
Moral of the story	A policy solution that is intended to solve the specified problem.	Make vaccination voluntary (anti-vax)
Plot	A story device linking the characters, evidence (setting), causal mechanism, and moral of the story (policy solution). Common plots include decline and control (Stone 2012).	Story of helplessness and control: Before vaccines became widely used, infectious diseases killed thousands of children and adults each year. Vaccination greatly reduced the burden of infectious diseases. (pro-vax)
Science/ Evidence	Use of scientific certainty	Yes. (pro-vax)
Condensation symbols	Reduction of complicated policy issues into simple and memorable forms	Anti-vaxers are "charlatans". (pro-vax)
Policy surrogates	Larger persistent controversy, in which the policy problem is wrapped	Democracy: Mandatory vaccination violates individual rights. (anti-vax)
Narrative Strategies		
Expansion	A policy story depicting concentrated benefits and diffuse costs that is intended to draw in more participants and expand the scope of conflict.	Pharmaceutical companies benefit from selling vaccines whereas our children suffer from negative side-effects of vaccination. (anti-vax)
Containment	A policy story depicting diffused benefits and concentrated costs that is intended to dissuade new participants and maintain the status quo.	Vaccines protect not only individuals but entire communities. The risk of a vaccine causing serious harm, or death, is extremely small. (pro-vax)

Note: Columns 1 and 2 are based on Shanahan et al. (2013, p. 459) and McBeth et al. (2007, p. 90-92).

In the next step, the policy documents are content analyzed for narrative elements and narrative strategies. These variables are operationalized based on the existing theory. Each is explained in more detail in Table 1. Coalitions are then identified based on the desired policy output (Shanahan, 2013, p. 464). The pro-vax coalition is in favor of mandatory vaccination, the anti-vax coalition is in favor of voluntary vaccination.

The Narrative Policy Framework promotes a directed approach to content analysis. Coding can begin with the predetermined codes (see Hsieh & Shannon, 2005, and Table 1). Data that cannot be coded are analyzed to determine if they represent a new category or a subcategory of an existing code. Once the policy narratives are coded, it is possible to calculate the frequencies and test the hypotheses summarized above. For example, it is possible to examine intercoalition differences in the use of narrative elements, narrative strategies and policy beliefs or intracoalitional cohesion, i.e. differences in the use of narrative elements, strategies, and policy beliefs between the groups comprising the coalition (ibid., p. 462). Both hypotheses can be formally tested, for example using statistical tests of difference between narrative elements or narrative strategies of the competing coalitions.

At the meso level, the Narrative Policy Framework thus offers tools for the analysis of intercoalitional differences in the use or non-use of scientific evidence by the competing coalition. Furthermore, it enables us to analyze how coalitions respond to the scientific evidence presented by the competing coalition. For example, when the pro-vax coalition tries to establish the scientific certainty, the anti-vax coalition may choose to dispute the scientific evidence (these studies were paid for by pharmaceutical companies) or resort to the use of policy surrogates (vaccination violates individual rights) or condensation symbols (vaccines are toxic). At the same time, the study of policy narratives enables us to identify successful narrative strategies and could thus provide information on the narrative strategies of health communicators.

Conclusions

This paper reviewed the theoretical approaches to the study of the use or non-use of scientific evidence in the policy-making process, focusing on "wicked problems" (Rittel & Webber, 1973), which are characterized by intense value-based conflict between competing coalitions (McBeth et al., 2007, p. 89). As wicked problems resist "resolution by appeal to the facts" (Schon & Rein, 1994, p. 4), "the only things left to examine are...stories" (Roe, 1994, p. 3).

The Narrative Policy Framework introduced by Jones & McBeth (2010) offers tools for the study of these "stories", or policy narratives, which are assumed to (1) link external shocks and policy change in the Punctuated Equilibrium theory, (2) serve as a tool for policy entrepreneurs trying to merge streams in Multiple Streams theory, and (3) be strategically used by coalitions to expand or contain the policy conflict in the Advocacy Coalition Framework (McBeth et al., 2007, p. 90; Nowlin, 2011, p. 53; Shanahan et al., 2013, p. 455). The Narrative Policy Framework predicts that both coalitions will try to portray themselves as losing so as to expand conflict and mobilize opposition in wicked policy environments (Shanahan et al., 2013, p. 462).

At the micro level, NPF is concerned with the impact of policy narratives on individual attitudes. For example, do these individuals respond better to expert-based information

in a technical or narrative format? How does the source of the expert-based information influence their attitudes? At the meso level, NPF examines how competing coalitions engage in strategic storytelling to influence policy outcomes. For example, how is the scientific evidence used to contain the conflict and maintain the status quo or expand the conflict and mobilize the opposition? At the macro level, the impact of institutional or cultural narratives on policy outcomes is the main interest. However, the linkages between various levels are not entirely clear and should be the subject of future research.

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